SCIENCE

NEW SERIES
VOL. XLVIII No. 1246

FRIDAY, NOVEMBER 15, 1918

SINGLE COPIES, 15 CTS.
ANNUAL SUBSCRIPTION, $5.00

SCIENCE

FRIDAY, NOVEMBER 15, 1918

CONTENTS

MSS. intended for publication and books, etc., intended for review should be sent to The Editor of Science, Garrison-on-Hudson, N. Y.

EDUCATION, SCIENCE AND LEADERSHIP[1]

THE British Science Guild has sustained a grievous loss by the sudden death of Sir Alexander Pedler, who for eleven years was its valued honorary secretary. To all the work of the guild he brought wide experience and ripe knowledge. He gave his time freely to its service, and he has been a wise counsellor and a true friend during its early years. He died, as he would have wished, while engaged in work for his country.

Professor Gregory has dealt with our annual report and the objects at which we have aimed in the past year; but there is one matter to which I wish to direct special attention. The war has forced upon us the necessity for efforts to establish the manufacture of many articles formerly obtained mainly or entirely from abroad. Among such products and appliances are synthetic dyes, pharmaceutical and medicinal preparations, glassware and optical instruments, medical and surgical apparatus, and other important requirements alike of peace and of war. The fiction, if it existed, that German science was an essential factor in manufactures of this kind has been permanently dispelled. The guild is organizing an exhibition of British scientific products in order to show what has recently been accomplished by British science and industry. His Majesty the King has graciously consented to be patron of this exhibition and Lord Crewe is its president. The exhibition will be open at King's College next August, and we hope that it will effectively demonstrate the successful application of British scientific research and ingenuity brought into play to meet the needs of the war, as well as prove conclusively that our dependency on Germany in certain departments of industry can be overcome.

[1] Presidential address to the Annual Meeting of the British Science Guild, June 19, 1918.

Last year I endeavored to direct attention to some of the conditions which post-war reconstruction demands, and to indicate the direction in which we must move if we are not only to rebuild our national prosperity, but also to base it on broader foundations, so that it may be shared by every honest worker with hand or brain. Much has happened on sea and land since April of last year, and the war still dominates our activities and absorbs our thoughts. It has now been made plain to us all that the fate of the world will be determined on the western front, as was inevitable. And to the vast majority of the English-speaking peoples it has become clear that no enduring peace—no peace compatible with honor and such as would enable us to begin our great task of reconstruction—is possible until Germany accepts defeat. The Allies have frequently disavowed all desire to crush Germany out of national existence. That idea is a fiction invented, like many others, by her Prussian rulers to induce the masses to bear their growing burdens and to acquiesce in the reckless squandering of their manhood. It is in the general interest that Germany should remain a great power; but the accursed spirit which has been deliberately instilled into the German people—the spirit which is responsible for the greatest catastrophe the world has known, and for the infamies committed by the German navy and army—must be destroyed. Otherwise there can be no rest for mankind, and civilization will perish. The war, with all its cruel losses, sorrows and suffering, must continue until the menace of German militarism has ended and the nations of the world, small and great, are left free to develop in security on their own chosen lines. If ever there were doubts as to the issue, they have been dispelled by the splendid resistance which the Allies are offering to the German masses and by the gigantic efforts which America is making to bear her full share in the battle for human freedom.

In the year that has passed, our plans for reconstruction have made some progress, and we have gained more insight into our national needs. Always, as we seek to weigh our past methods in the balance and to find remedies for the blemishes in our national, political and industrial life, the task before us seems to grow in magnitude and difficulty. And always, if we try to trace the ultimate cause of some failure, blunder, or sign of weakness, we arrive at errors of judgment due either to lack of knowledge or to neglect to apply knowledge that was available if sought. Two of the outstanding tragedies of the war—the operations in the Gallipoli Peninsula and the breakdown in Mesopotamia—have been exhaustively examined, with the result of proving that necessary knowledge was either ignored or not ascertained by the individuals responsible. In other cases, similar investigations must have led to the same verdicts.

The stern necessities of the war have forced upon successive governments the employment of trained non-officials in many capacities. The work accomplished under conditions of extemporization has been marvelous in amount, and it supplies evidence of our innate organizing capacities; but there has been lamentable waste. Government has not always succeeded in using experts to the best advantage. Square men have been too frequently placed in round holes, and in the building up of new departments of state the coordination of effort and the essential principles of sound administration have been palpably lacking. The foresight required to convert a peace-loving people into an armed nation and to fulfil on a sudden all the vast and various demands of the greatest of all wars is necessarily rare; but it can not be said that the best use has been made of the trained intelligence at our disposal, and our political methods have not proved well adapted to a supreme national emergency.

Meanwhile, we have been brought face to face with German efficiency, deadly in some aspects, because concentrated during many years upon deliberate preparation for world conquest. We are only now beginning to understand the meticulous care with which every requirement that could possibly be foreseen had been studied and provided for in advance. In the years before the war, we had often been warned of growing competition in

trade, and it was certainly true that German exports of home production to European countries were rapidly mounting and tending to supplant our own. This was due alike to advantages of position and of communications as well as to the far-sighted policy of the German government. In the general markets of the world outside Europe, however, we were more than holding our own, and Mr. H. H. O'Farrell has shown that in the periods from 1895–99 to 1910–13 we had nearly doubled our superiority to the Germans, owing largely to the magnitude and efficiency of our mercantile marine.

What we failed to recognize was that German peaceful penetration was directed to obtain financial control of certain key industries and vital raw materials in order that, when it was decided to light the fires of war we should be placed in a position of grave difficulty in the manufacture of munitions. A further object was, I am now convinced, involved. It was desired that as many influential persons as possible should be closely entangled in financial interests of which Germany held control, so that during and after war Germans in this country might obtain protection. In no other way can the amazing tenderness shown to Germans, which has given rise to strong resentment, be explained. The treatment of British subjects in Germany, and the liberty accorded to Germans among us offers a most startling contrast.

As little did we realize the strenuous German propaganda stealthily at work all over the world before August, 1911, and since develop with lavish expenditure. Every country of the Allies and of neutrals has felt this malignant influence. Mainly by its agency, Russia has been brought to ruin, and the fair hopes of victory last summer, which we were justified in cherishing, have been deferred. Italy was brought close to disaster by the same means, but has nobly rallied. France is still dealing with the unseen hand, and America has been forced to take drastic measures. Here, as in Ireland and in India, the effects of the most insidious weapons of the German government have been felt, and they have not yet disappeared.

I mention this as a typical example of German efficiency and forethought of a kind which the British nation would rightly have scorned, but which have told heavily in the war and must be guarded against in the future. In the higher regions of statesmanship, that efficiency has inevitably failed. A government which confidently believed that it had the right, by reason of the alleged inherent superiority of the German nation, to force its will upon all other peoples, was naturally unable to understand their mentality; and the arrogance bred of the consciousness of military strength entailed serious miscalculations for which Germany will pay heavily. Impressed with the baseless idea that atrocities, if sufficiently revolting, would intimidate her enemies, the kaiser and his accomplices have succeeded in arraying against themselves all the free nations in the vanguard of progress. They have made the German name and Kultur by words and synonyms of barbarism. They will find that the moral reprobation of the civilized world will dog their footsteps in the years to come, and that the final overthrow of the power of their present governing classes will be the necessary first condition of their readmission to the family of nations. We can learn from German methods what to avoid.

In our projects for national reconstruction there is perhaps a tendency to regard increased industrial and commercial efficiency as paramount. This may be natural, because nothing but a great development of economic production within the empire can restore our heavily burdened financial resources. But, if we read the lessons of this war aright, we must see that this alone can not suffice, and that our industries might be paralyzed by antagonistic forces arising from want of other than purely technical efficiency. Peace will find us face to face with new problems of democracy still unsolved. A huge new electorate will convey political power to masses of men and women for the most part slenderly equipped for the responsibilities which they must assume. Democracy is still on its trial,

and its limitations are frequently forgotten. The masses can never build; but they can always and easily destroy, as the wrecking of Russia, following historical precedents, plainly shows. They can, however, for good or for evil, choose their rulers and displace them when they please. The theory that the intensely complex and vastly important work of modern governments can be continuously inspired by the will of the people is untenable. The hopes of the future depend upon the trained and disinterested leadership of a minority, in the workshop as in the cabinet, and upon the intelligent acquiescence of the majority.

During the war, the duties normally undertaken by government have been immensely extended and not always satisfactorily discharged. It has become more than ever clear that private enterprise and initiative, by which the trade and commerce of the empire were built up, are far more efficient than the agency of government. But there is work to be done which must be entrusted to government and to elected local authorities; and private enterprise will need assistance in certain directions, and some measure of wise control in others. When peace comes, more will be demanded from our governments than they have been accustomed to undertake in the past, and trained intelligence in our departments of state and wherever leadership and direction are required will be the essential condition of successful reconstruction. Of the future of democracy, nothing is certain except that it must inexorably depend upon the character of the acquired knowledge of the leaders whom the enfranchised masses elect to follow. And as the choice of leaders will be decided largely by the moral and intellectual equipment of the masses, the importance of sound and widely diffused education must be vastly enhanced in the years to come. Germany has shown to the world the appalling results of an education directed to Prussianize a great people and to concentrate their minds upon materialistic ideals to be enforced by arms on other nations. Our education must seek to inspire ideals of another kind—the true patriotism which places the national welfare in the forefront of its efforts, which desires nothing at the expense of other peoples, which regards peace as the greatest of blessings and the sure safeguard of the progress of mankind, and relegates force to the righting of wrongs in the last resort.

Since the last annual meeting of the guild, all questions of education have been under discussion, and we now know better where our weakness lies and the entent and nature of our needs. In the number of our institutions providing higher education America alone stands ahead of us. Sir Robert Hadfield has pointed out that Great Britain and Ireland have one university per two and one half millions of population as compared with one million in America. In the dominions, on the other hand, where the population is relatively sparse and the distances great, the proportion is one university to two thirds of a million of people. This numerical comparison is, however, misleading, except that it indicates educational centers capable of extending their activities. The true criterion is the number of students who undergo a complete course of training. Of full time students only 4,400 entered our universities in 1913–14, and of them several hundred were foreigners who would subsequently leave this country. Putting the output of university and technically trained men and women in another way, it appears that per 10,000 of population there were 16 full time students in Scotland, 13 in Germany, 10 in the United States, 6 in Ireland, 5 in England and 5 in Wales. The figure given for the United States includes only students at universities and technical schools of recognized standing. If all students taking four-year courses at such institutions were included the rate per 10,000 of population would be doubled. It is impossible not to believe that these figures help to account for the high standard of intelligence in Scotland and America and for the success of the Scottish and American peoples in many spheres of activity, while the relative backwardness of England, Ireland and Wales must exercise an influence in public life.

The financial test shows a deplorable inferiority to the United States and Germany, and must indicate roughly the relative importance attached to higher education in these countries and our own. Thus the total incomes of state-aided modern universities and university colleges in England and Wales is about £700,000, of which 34 per cent. is derived from parliamentary grants. The corresponding figures for Germany are nearly £2,000,000 and 80 per cent., and the University of Berlin alone receives from the state an annual grant nearly equal to that given to all the university institutions of England and Wales. The annual income of the American universities and colleges is £20,000,000, of which £7,000,000 is at the disposal of the colleges of agriculture and mechanical arts. Private benefactions towards higher education in the United States amounts to more than £5,000,000 a year. With us they do not reach one twentieth part of this sum.

The only possible inference from these figures is that, as compared with the United States and Germany, our higher education is lamentably inferior in quantity. We are not producing trained leadership sufficient for our needs, and the diffusion of knowledge is pitifully inadequate to the requirements of a modern state. If an analysis of the kind of training received by our governing classes were possible, it would be found that scientific knowledge was exceedingly rare and even non-existent in some quarters, where it is essential. Sir Robert Hadfield states that in one important government institution devoted to educational work, about 90 per cent. of the principal officials have received a classical training, and only 5 per cent. have been educated in science. Mistakes and inertia in the direction of public policy and in administration are thus explained. There is not enough knowledge of the right kind in governments, departments of state, or parliaments, while, in the world of industry, a sufficient supply of trained research workers can not at present be obtained. Until this requirement is fulfilled, the development of new industries on a large scale must be impracticable.

The excellent report of Sir Joseph Thomson's committee on the position of natural science in education throws a flood of light on our national deficiencies, and points the way to educational reconstruction. The committee justly claim for sound science teaching that:

> It quickens and cultivates directly the faculty of observation. It teaches the learner to reason from facts which come to his notice. By it the power of rapid and accurate generalization is strengthened. Without it there is real danger of the mental habit of method and arrangement being never acquired.

All thoughtful students of our public affairs must admit that, alike in peace and in war, our leaders in all classes have shown a certain lack of the qualities which science training can impart, and that national interests have suffered grieviously for this reason. The power of reasoning from facts and of "rapid and accurate generalization," combined with the habit of "method and arrangement," is the best possible qualification for cabinet ministers as well as for all leadership on lower planes; and the British Science Guild has persistently urged that science should take a prominent place in the education of our public servants.

The committee recall the fact that the neglect of science was noted by a Royal Commission on the public schools more than half a century ago. The position of scientific instruction in the United Kingdom was also surveyed in detail in 1872–75 by a royal commission, of which the Duke of Devonshire was president and Sir Norman Lockyer, the founder of this guild, secretary. But although there has been advance in recent years, it has required the shock of a world war to make us broad to our shortcomings. The champions of classical learning are now moderate in their claims. The Council for Humanistic Studies declares that the future citizen should possess knowledge, not only of the physical structure of the world, but of "the deeper interests and problems of politics, thought and human life," and that he needs "scientific method and a belief in knowledge even more than physical science." This marks a change of attitude, and the advocates of the dominance of science in

education would agree, with the proviso that applications of science unknown to the ancients determine the conditions of health and of economic stability in modern life, and that a "belief in knowledge" and "method" in pursuing it are best inculcated by the study of law in the natural world.

The great merit of Sir Joseph Thomson's Report is that it discloses the present causes of the weakness of science in our education. The universities as a whole now show a bias in favor of science teaching, but there is a deplorable lack of students due partly to weakness in the schools and partly to the influence of scholarship examinations in which classics predominate. Thus the old universities, by their scholarship systems, tend to discourage science teaching in the public schools, and the public schools react upon the preparatory schools. It follows that many of the most intelligent boys are deterred from entering upon a scientific career. It is also possible that some class prejudice, based upon long tradition, dating back to the Rennaisance, may still operate against science training. The recommendations of the committee are wise and far reaching; but I can only give the barest indication of their objects and scope. Nature study in primary schools up to the age of twelve is to be the foundation, and instruction in science up to the age of sixteen is enjoined upon all secondary schools, physics and chemistry to be taught, because all other sciences, to which they should be treated as passports, require some knowledge of them. Mathematics should be connected with science at an early period. The general aims of a science course at school age are defined with a view to secure two educational objects of primary importance: (1) To train the mind to reason about things the boy observes himself, and to develop powers of weighing and interpreting evidence. (2) To develop acquaintance with broad scientific principles and their application in the lives of men and women.

No better foundation for the training alike of the statesman, the leader of commerce and industry, and the manual worker, can be laid down. The committee were strongly impressed with the importance of manual work at school age, and speaking from personal experience I am certain that I owe much to the handling of the file and the lathe before I entered the army, although mechanical pursuits at one time caused me to neglect other studies. I believe that if all classes underwent some manual training there would be a better understanding of the dignity of labor. Rightly distrusting examination tests of conventional type, the committee recommend the inspection of all schools.

Higher standards of teaching power, coordinated training from the primary school to the university and to the post-graduate stage, with a lowering of fees and a liberal allocation of scholarships to be awarded for "intellectual merit and promise," and not in accordance with the results of set examinations—such are the educational ideals which are set before the country. By these means we may hope in time to develop intelligence now wasted, as the committee point out, to supply our present deficiency of experts in all branches of science, and to secure more orderly methods of administration and a higher standard of leadership.

The American Declaration of Independence unfortunately proclaimed without qualification that all men are born "equal," and this theory has proved very harmful. In physical, as in intellectual capacity, men show the extremes of inequality. From the technically entitled "feeble-minded" to the intellectual giant there is an infinitely graduated range of ability in all classes. Heredity may confer some advantage; but genius generally mocks at heredity, and the frequent rise by sheer ability of men from the ranks of manual workers seems to prove that brain power in the case of a fairly homogenous race exists in due proportion in all classes. The object of national education must be to provide, so far as possible, equal chances for natural talent wherever it is to be found. Otherwise, there must be loss of national efficiency. At the same time, it must be remembered that marked intellectual power will always be the possession of a minority, that real leadership will always be rare, and that training in all classes may be wasted if

carried beyond the inherent capacity of the individual boy or girl.

Mass education will at best only approximate roughly to the ideals we set before us; but it can do much by stimulating the available intelligence, and by not only disseminating, but instilling the desire for knowledge, which is the essential foundation of sound judgment and the vehicle of truth. Thus the great education bill which awaits the sanction of parliament will have far-reaching effects upon the national life in the future. Continuity till the age of fourteen at least will provide an increase of school time which can be turned to good account, and will put all boys and girls on one equality; compulsory further part-time training to sixteen and later to eighteen will ensure a minimum of teaching to the whole of our youth, and it will have the great advantage that the state will be able to watch over a critical period during which careers can be made or marred. It is a sad fact that at present many more than two and one half millions of our boys and girls between twelve and eighteen have no opportunity of education and may be neglected in body and soul. Mr. Fisher has made wise provision for physical training, which will help to raise the standard of national health, and if the churches and denominations could arrive at some agreement, it should be possible to inculcate duty and discipline, honor and true patriotism, based on the eternal principles of righteousness.

Whether the bill will secure higher training for the children who show special ability must depend upon numerous scholarships awarded only to those who show fitness, and upon the reduction of university fees in special cases. Of about 600,000 children who now leave the elementary schools annually, only about 1 per 1,000 reaches a university. This is far too low a proportion, and it indicates the denial of that equality of opportunity which must be our ideal. I believe that education attained at some self-sacrifice is enhanced in value to the recipient; but, where there is absolute necessity, it is for the state to ensure that the gifted boy or girl shall not lose the chance of distinction. If the recommendations of Sir Joseph Thomson's Committee are grafted upon the machinery of the education bill, there should be a great increase in the number of science students. The manual workers will not only have no bias against science as a career, but are likely to be attracted towards it. We may hope in future to draw from them a valuable reinforcement to the trained research workers, who will be more and more needed in every department of industry, while they will strengthen the ranks of the leaders of thought in all branches of public and private activity. Education will always depend upon the character, personality and enthusiasm of the teacher, and one great merit of Mr. Fisher's Bill is that it will raise the importance and dignity of the great profession of teaching.

The war has changed the whole outlook of the nation, swept away many prejudices and revealed alike our strength and our weakness. Our fighting men on sea and land and in the air have given to us inspiring examples of patriotism, gallantry and cheerful endurance. In spite of some unpleasant symptoms, the heart of the British people has proved sound and true when tried in the furnace. "The former things have passed away," and our country can never again be as it was four years ago. The reconstruction which lies before us involves political, social and economic changes for which the lessons of the war, if we turn them to full account, can smooth the way. The strenuous work of all classes with hand and brain is the essential condition of industrial regeneration. For well-known reasons, among which want of trust between employers and employed is prominent, our production has been far below that of America. This grave defect must now be removed by shared counsels and frank mutual understanding. Capital and labor are indissolubly bound together by common interests, which are also the interests of the nation as a whole. Nothing except harmonious cooperation, based on good-will and directed by trained intelligence, can ensure the increased and well-ordered production upon which good wages and the social reforms which we all desire absolutely depend. A more equable distribution of wealth will be

a national advantage; but unless wealth is continuously created we can not make good the huge wastage of resources which the war has entailed, and we shall be faced with bankruptcy. Much more is, however, required of us. In the cleansing fires of war, the gold and the dross have been thrown into sharp contrast. If we are to rebuild our national life on purer and healthier lines, so that it may be worthy of the heroes who have fought and died to save Britain from the greatest peril she has ever encountered, the gold must be cherished and the dross must be discarded. The whole future of the empire will be determined by leadership in all classes alike—leadership inspired by self-less motives and based upon patriotism and knowledge.

In the "Wisdom of Solomon" there are words which democracy must take to heart if it is not to prove a disastrous failure. "Neither will I go with consuming envy; for such a man shall have no fellowship with wisdom. But the multitude of the wise is the welfare of the world."

Sydenham

AGRICULTURAL TEXT-BOOKS FOR OUR PUBLIC SCHOOLS

One of the results of the activities of the agricultural colleges and the experiment stations is the production of an immense quantity of both general and special literature on agriculture. In this literature we find an increasing number of text-books intended for the use in our public schools. This, in itself, may have been influential in stimulating the modern public demand for agricultural instruction in the public schools of both the country and the towns—a demand which is very sane.

It is a matter of common observation of those who have had the opportunity to observe, that nowhere in the old world do we find that interest in the soil and its products among the non-farming classes, or as great a respect among them for the tilling and the tiller of the soil as in America. In many places of Europe, there yet lingers the prejudice of the city dweller against the peasant, who once was tied to the soil and owned by the owner of the soil, for whose support it had pleased God to allow him to exist.

In this country, it is a frequent occurrence to find business and professional men of the city, not only to pride themselves on their skill and experience as cultivators of the soil, but to carry that skill and experience into actual operation in their management of rural affairs. Hence, the teaching of agriculture in all of our public schools of both city and country is an increasing demand. The exact scope of this teaching and to what classes, or what maturity of pupils it is to be applied, seems yet to be an unsettled question, judging from the nature of a large part of the many text-books published for this purpose.

Some of these text-books seem by their style of language to cater to the tended minds of the primary grades, but in their scope and the nature of the topics to be intended as guides for the professional farmer in his practical operations. Agriculture, as a subject in our public schools will fail to educate and intertain the minds of the pupils, if heavily burdened with dry recipes for increasing the number of dollars, or lectures upon mere physical operations of running a farm. The highly interesting biological, chemical and physical principles underlying these operations would, however, not fail to stimulate and elevate the young mind, as adding interest to the operations in themselves. The language, too, in which these subjects are taught, should be in a simple, yet good virile English, and not in the blabber of the baby; for no ambitious boy or girl is willing to stoop to a lower level of intelligence, but anxious to reach out for a higher.

In several of these text-books on agriculture, we find some very strange incongrueties; for example, matters requiring a well developed intellect and considerable maturity of judgment for their comprehension are discussed in a language suitable to the kindergarden tot. One author, in describing the nitrogen-generating bacteria on the roots of the legumes, regrets that he has to use the big word, tubercle; but admonishes his pupils to learn

its meaning and how to pronounce it. Yet, in spite of this supposed immaturity of the minds and the vocal organs of his pupils, this same author manages in his book to treat of all living things of importance on the farm, from the bacterium to the horse, and all the operations, from preparing the soil for the crops to the marketing of their products; nor does he stop at that, but devotes much space to rural sociology.

Another author who feels "that there is a need and a demand for a book that will standardize seventh and eighth grade agriculture" has produced one in which the "arrangements of chapters follow as closely as possible the farmer's seasonal occupations." In his preface, this author says:

> Such topics as the origin, history and importance of farm crops and animals are about agriculture, but such topics as how to produce larger yields, use more prolific varieties, the use of high grade and pure bred stock, how to feed well and economically, how to improve the soil, how to combat enemies and how to choose, plan and manage a farm, are topics that deal with making our agriculture productive. This is not primarily a book about agriculture; but on productive agriculture.

If a book dealing with the various natural laws and principles underlying agriculture is a book about agriculture, the author is correct in stating that his book is not about agriculture, nor is it a text-book on agriculture, but a manual giving forth in a dry and matter of fact way directions for the performance of the numerous operations required in the management of a farm. The cost in labor and money, and the profits direct and indirect are, of course, the principle lessons to be inculcated by such teaching.

More attention to the principles of plant and animal life would have added interest and animation to the subject, and more care in the statements concerning facts in plant life would have avoided some obvious blunders. For example, in the table giving the minimum, optimum and maximum degrees, Fahrenheit of the germinating temperature of the seeds of various farm crops, that for the red clover is given as 88°–99° min., 99°–111° optim., 111°–122° maxim.,—Any girl or boy old enough to have begun the study of primary geography, will know that such a peculiarity would banish the red clover from the temperate zone. This book is not the only text-book on agriculture written for the public schools that is encyclopedic in its scope and character, since a great number have been constructed on the same plan.

One author makes the following confession in the preface to his book:

> Agriculture is too complex for all the details to be mastered by one person. The expert in crops or soils does not possess more than a general knowledge of live stock, fruit growing and dairying. In the subject of crops, there are those who have specialized in grains, forage crops or grasses. In animal husbandry, there are the specialists in beef cattle or dairy cattle, specialists in draft horses or light horses, and specialists in sheep and swine. If a man attempts to speak out of his own knowledge on all the phases of agriculture, covered by a school text, the treatment of many of the subjects would be inaccurate and misleading, or else so general as to be of little value. To insure for each branch of the subject an expert, who is responsible for a large part of the material in the field of his specialty, the author has organized this material into a logical, teachable work on agricultural science and practise.

The author of this book has by the help of his experts, whose list of names and specialties covers a solid page of his preface, composed a work that is as impossible to teach from, for one teacher, as it was impossible for the author unaided to write it all from his own knowledge. There is no necessity for commenting on the difficulty that would confront the pupils in attempting to master such a text.

Briefly, it may be said that, in the greater number of these "text-books on agriculture for the public schools," the pupils are expected to cover more agricultural subjects, frequently crowded together in an incoherent way and stripped of all philosophical connective tissue, than any student in the state agricultural colleges, where he has a four year's course with specialists for teachers, supplied with all the equipments for demonstration. As a men-

tal nourishment, such a repast, as offered by many of these books, is both too dry and too bulky for digestion,—nor are many cooks an insurance against "spoiling the broth."

What is, then, a logical and reasonable scope for the agricultural teaching and the text book in agriculture for our public schools?

The simplest way out of the dilemma would be to return to the idea of "a book about agriculture" and give up the idea of "productive agriculture" for our public schools. In its place, it would be the object of the agricultural teacher to make intelligible to his pupils, in a general way, those biological, chemical and physical principles underlying our agricultural operations. Hence, agricultural botany and zoology, including a history of the practical phases of the evolution of our "animals and plants under domestication." The practical operations and the history of their evolution should not be lost sight of, but be subordinate to what we might call the scientific aspects, yet diligently drawn upon for the elucidation of these. The subject, thus handled, would not be incomprehensible for one author, or one teacher, or to all the pupils, but be within the scope of the average human mind.

A good text book goes far towards making up for the deficiency of the teacher, and a poor text-book goes equally far in hampering the efficiency of the teacher. Not the least consideration in the value of a text book is its style. A book with a faulty style is like a poorly prepared, or badly seasoned meal, it is taken with a sense of repulsion. There are some of these text books, in which to their small merits are added the demerits of a bad stlye.

H. Ness
Horticulturist, Texas Experiment Station,
College Station, Texas

FRED SILVER PUTNEY

Fred Silver Putney, professor of experimental dairy husbandry at the Pennsylvania State College, and well known among dairy professors and investigators throughout the United States, died of pneumonia at his home in State College, Pennsylvania, on October 5, 1918.

Always interested in live stock problems, in recent years he has devoted his energies to teaching and fundamental research along the lines of animal nutrition. Dairy cattle feeding problems have been his special interest and his work along these lines is well known. He is co-author with Dr. C. W. Larson of the text-book and general reference work, "Dairy Cattle Feeding and Management," and in conjunction with Dr. N. P. Armsby, of the bulletin, "Computation of Dairy Rations," in addition to numerous papers on dairy management and nutrition.

Professor Putney was born in Hopkinton, N. H., on November 10, 1881. He was graduated from the Concord High School in 1901 and received the B.S. degree from the New Hampshire State College in 1905. In 1908 the Pennsylvania State College conferred upon him the degree of Master of Science, and he had completed recently the requirements for his doctorate degree at the University of Wisconsin.

Professor Putney first went to the Pennsylvania State College in 1906 where he worked with Dr. H. P. Armsby as an assistant in animal nutrition and general experimental work until 1908. That year he became assistant to Dean F. B. Mumford, of the college of agriculture, University of Missouri, at which institution he continued his studies in nutrition towards a doctorate degree. From Missouri he went to the Rhode Island State College as professor of animal husbandry and head of the department, and he remained at that institution for several years. In 1913 he returned to the Pennsylvania State College as assistant professor of dairy husbandry, and later became professor of experimental dairy husbandry.

For the past years, Professor Putney has been on leave of absence for advanced study in animal nutrition. This time he spent at the University of Wisconsin and had just completed the requirements for his doctorate degree. Professor Putney married Miss Bertha Bond of Urbana, Illinois, September

2, 1911, and they have one daughter, Ellen Ayers Putney, who was born July 6, 1917. Professor Putney was a member of the American Association for the Advancement of Science, the Dairy Science Association, Alpha Zeta, Theta Chi, Acacia and the Order of Free and Accepted Masons. Just in his prime and in the fullness of his powers, the loss of Professor Putney will be keenly felt by his wide circle of friends and associates in dairy work. He had that rare combination of practical common sense combined with research ability which enabled him to keep a proper balance in all problems of a research nature. By his death, science has lost a well-trained and efficient worker.

VON ADOLF ERICH DAECKE

VON ADOLF ERICH DAECKE—born in Germany, place and date unknown—died at Richmond, L. I., New York, on October 27.

He was entomologist to the department of agriculture of the Commonwealth of Pennsylvania. His work in the New Jersey Museum Reports of 1905–7 and 9 on Diptera was excellent—his knowledge of the Odonata was quite accurate. His name is immortalized in the family of Pipunculidæ in the specific name of the genera *Nephrocerus daeckei*. His nature was very kind, as was shown by the manner the squirrels in Capitol Park upon the sound of his voice or footsteps would spring toward and climb over him, awaiting a word and a caress—when he spoke to them they seemed to comprehend his conversation, his affection for children was wonderful and they were so pleased when he told them of the superficial observation of insects and animals they never seemed to tire of his discourses made so plain by him.

He was a devoted fellow of the Harrisburg, Pa., Natural History Society; from the membership he formed excursions along the byroads and brooklets and over the mountains searching for the local avi- and zoo-fauna; his enthusiasm added many more to its membership. The charm of his interest in his students endeared him to them while his attainments were equally fascinating to them.

He was a member of the Entomological Section of the American Association for the Advancement of Science and attended its meetings with the vigor of youth, although a man in the fifties, was also a member of Academy of Natural Sciences, Philadelphia, and several scientific societies on the European continent.

He was a sincere friend and generous to a fault—was uncommonly fair in scientific discussion. However, he had very decided views of the superiority of the Germans; he could not read English without a curious disturbance overcoming his usual affability. H.

SCIENTIFIC EVENTS

THE UNITED STATES PUBLIC HEALTH SERVICE AND THE INFLUENZA EPIDEMIC[1]

WITH the widespread occurrence of influenza in the vicinity of Boston, and the unmistakable signs of its beginning elsewhere, urgent calls were addressed to the United States Public Health Service to furnish medical and nursing relief to stricken communities. All available regular officers were detailed to the stricken communities, but the number available for such detail was insignificant compared to the urgent need occasioned by the epidemic. Moreover, the bureau had no nurses available for service in epidemic.

In this emergency the Surgeon General called upon the Volunteer Medical Service Corps, the Red Cross, the medical and nursing professions as a whole, and on the general public for personnel to help combat the epidemic. At the same time Congress was appealed to for a special appropriation to meet the expenditure required by the emergency. The necessary funds were promptly voted.

In response to the request for physicians available for duty in the Public Health Service, the Volunteer Medical Service Corps compiled a list of over 1,000 names classified by states. Appointments were offered by tele-

[1] Publication authorized by the U. S. Public Health Service.

graph to these physicians by the Public Health Service, and within forty-eight hours groups of physicians were on their way to some of the stricken communities in New England, where the epidemic at that time raged most severely. Soon after, similar medical units were sent to New Jersey, New York, North Carolina, and to Phœnix, Ariz.

The problem of supplying nurses was much more difficult, for it was found almost impossible to discover nurses or trained attendants who were not already extremely busy on urgent medical work. Nevertheless, a limited number of nurses and trained attendants was secured by the American Red Cross and mobilized for emergency service in the communities most severely affected. In addition to this the attention of local communities was called to the valuable nursing work which could be rendered by intelligent volunteer workers, such as school teachers, especially when they are directed by trained graduate nurses. In many communities the organization of this group of nursing personnel has done much to relieve the serious emergency caused by the lack of trained nurses.

It was made clear from the outset that the United States Public Health Service desired to aid and not supplant state and local health authorities in their work. Accordingly, instructions were issued that all requests for medical, nursing, or other emergency aid in dealing with the epidemic should come to the United States Public Health Service only through the state health officer. Moreover, as soon as possible all this epidemic work was organized on state lines with a representative of the United States Public Health Service detailed to each state to secure the best possible organization and coordination of health activities of the service, in others the executive of the State board of health has been given appointment in the United States Public Health Service as field director.

While the activities of the doctors and nurses working under the Public Health Service are generally limited to those ordinarily regarded as preventive health measures, emergency conditions in some communities have been such that much medical relief work has had to be undertaken. This was the case, for example, in several communities where the few practicing physicians were themselves stricken and where the people were in urgent need of medical attention.

FOREIGN DELEGATES TO THE AMERICAN CLINICAL CONGRESS

A PARTY of eminent surgeons from abroad, who came to the United States to attend the Clinical Congress which was given up on account of the influenza epidemic, has been making a tour accompanied by Lieutenant-Colonel George E. Brewer, M. C., U. S. Army, New York City; Colonel William J. Mayo, M. C., U. S. Army, Rochester, Minn.; Colonel Franklin H. Martin, M. C., U. S. Army, Chicago, and Dr. Pilcher, New York City. They have been entertained and have delivered addresses on various phases of military surgery in St. Paul, Rochester, Philadelphia, Chicago, New York, and other cities. The party consists of Colonel Sir Thomas Myles, Dublin, Ireland, Major G. Gray Turner, New Castle-on-Tyne, England, Colonel George E. Gask, St. Bartholomew's Hospital, London, Professor Raffaele Bastianelli and Major Pouletti, Rome, Major Pierre Duval and Lieutenant Henri Beclere, Paris, and Major Poillet, Ambre, France.

On November 6 they were the guests of the New York Fellows of the American College of Surgeons at a dinner at Delmonico's, presided over by Dr. J. Bentley Squier, the feature of which was the conferring upon the visitors of honorary fellowship in the college.

According to a press notice Dr. Squier, presided at the dinner. He reminded the gathering, including several hundred of the best known medical men here, that the clinical congress was to have undertaken important work in this country in October, but that the formal sessions had to be abandoned before the congress was convened because of the influenza epidemic.

Dr. Squier then introduced Colonel Franklin Martin, who related briefly the incidents of the delegates' journey. They went first to

Washington where they were received by President Wilson and his Cabinet. Then they traveled to Camp Greenleaf, the medical training camp where, Colonel Martin said, they presented the technical papers which were to have been read at the conference. Next the delegates went to St. Paul, Minn., where they visited the Mayo Clinic after which they went to Chicago, Philadelphia, and other important cities.

Colonel Martin introduced Colonel William J. Mayo, president of the American College of Surgeons, and then the candidates for honorary fellowships filed by the speaker's table, the little procession being led by General Ireland. He was escorted by Major General William C. Gorgas. As each member reached Colonel Mayo he halted long enough for Dr. Mayo to cite the achievements of the candidate.

General Ireland in his speech said that the fellowship was an unexpected honor and that he would treasure it as a trust to be held for the thousands of medical men of the American Army. Turning to a discussion of American Army medical experience abroad, General Ireland said wartime treatment of the sick and wounded had proved different in this war, and he paid generous thanks to the medical officers of the Allies for their aid to the Americans. Not only were the Americans taken to front-line formations and instructed, but important medical officers of the allied armies came monthly to the Research Council in Paris, thereby enabling that body to "do ineffable good and save countless lives." "American medical officers in France," General Ireland added, "have labored in France under many difficulties. Much of France's resources had been exhausted when we got there, and it was a splendid spirit with which our American doctors took up their great task. I think I may say that the achievement of American medical officers in France will add a bright page to American medical history. We still are short of personnel and material due to a lack of tonnage, over which we have no control, but I am confident these difficulties will be overcome in time to enable us to accomplish all that lies before us."

DIVISIONAL OFFICERS OF THE AMERICAN CHEMICAL SOCIETY

THE Divisions have elected the following officers for the ensuing year:

DIVISION OF INDUSTRIAL CHEMISTRY AND CHEMICAL ENGINEERING

Chairman, Harlan S. Miner; *Vice-chairman,* H. D. Batchelor; *Secretary,* H. E. Howe; *Executive Committee,* W. F. Hillebrand, S. W. Parr, A. W. Smith, David Wesson, J. G. Vail.

DIVISION OF BIOLOGICAL CHEMISTRY

Chairman, I. K. Phelps; *Vice-chairman and Secretary,* R. A. Gortner; *Executive Committee,* W. D. Bancroft, C. L. Alsberg, W. J. V. Osterhout, H. S. Grindley, Frederick Fenger.

DIVISION OF ORGANIC CHEMISTRY

Chairman, Lauder W. Jones; *Vice-chairman and Secretary,* Harry L. Fisher; *Executive Committee,* R. F. Brunel, Wm. J. Hale, O. Kamm.

FERTILIZER DIVISION

Chairman, L. L. Van Slyke; *Secretary,* F. B. Carpenter; *Executive Committee,* R. N. Brockett, H. J. Wheeler, C. H. Jones, E. W. Magruder.

DIVISION OF WATER, SEWAGE AND SANITATION

Chairman, Robert Spurr Weston; *Vice-chairman,* J. W. Ellms; *Secretary,* W. W. Skinner.

DIVISION OF PHARMACEUTICAL CHEMISTRY

Chairman, F. O. Taylor; *Vice-chairman,* H. W. Rhodehamel; *Secretary,* G. D. Beal; *Executive Committee,* E. B. Carter, H. C. Fuller, Herman Engelhardt, W. D. McAbee.

DIVISION OF PHYSICAL AND INORGANIC CHEMISTRY

Chairman, W. E. Henderson; *Secretary-Treasurer,* W. A. Patrick; *Executive Committee,* H. P. Talbot, E. C. Franklin, C. James, R. B. Sosman, J. N. Swan.

DIVISION OF AGRICULTURE AND FOOD CHEMISTRY

Chairman, W. D. Richardson; *Vice-chairman,* C. A. Browne; *Secretary,* T. J. Bryan.

SCIENTIFIC NOTES AND NEWS

THE degree of doctor of laws has been conferred on five members of the British Educa-

tional Mission at a faculty convocation of the University of Michigan. Those thus honored are: Dr. Arthur E. Shipley, the Rev. Edward W. Walker, Sir Henry Miers, Sir Henry Jones and Dr. John Joly. The degree of doctor of letters was conferred on Miss Caroline Spurgeon and Miss Rose Sidgwick.

In recognition of his distinguished services in behalf of military sanitation, Major General William C. Gorgas, until recently Surgeon General United States Army, has been made a grand officer of the Order of the Crown of Italy. The ceremony of presentation took place on November 5, in the office of the Surgeon General, the order being presented by Major General Emilio Guglielmotti, military attaché of the Royal Italian Embassy.

In addition to the silver service which was given to Dr. M. C. Whitaker on his retirement from the presidency of the Chemists' Club, an illuminated memorial, designed by Mr. Edward B. Edwards, has also been presented to him. The center is a Latin text written by Professor McCrea, of Columbia University, and the border decoration consists of portraits of Gerber, Bacon, Lully and Paracelsus in the four corners and alchemistic symbols worked into a decorative design.

Dr. Frank Schlesinger, director of the Allegheny Observatory, chief of the Department of Aeronautical Instruments, Engineering Division, Bureau of Aircraft Production, at Dayton, Ohio, has been elected a member of the Societa Spettrocopisti Italiani.

Mr. William deC. Ravenel has been placed in charge of the administration of the National Museum, with the title of administrative assistant to the secretary of the Smithsonian Institution, and in addition to the general duties of that office has been designated director of the Arts and Industries branch of the museum. He is a native of South Carolina, was educated at Union College, and has been connected with the museum since 1902. For many years he served as assistant in the United States Bureau of Fisheries, in charge of fish culture, and was acting commissioner at various times from 1896 to 1902. He represented the Bureau of Fisheries and the National Museum at all national and international expositions for many years, and was secretary of the United States Government Board of the Panama-Pacific Exposition at San Francisco in 1915.

Mr. Edwin H. Pagenhart, hydrographic and geodetic engineer of the U. S. Coast and Geodetic Survey, has been transferred to the Corps of Engineers (Reserve) of the army, with the rank of captain.

Mr. Edward P. Bartlett, formerly assistant professor of chemistry at Pomona College, Claremont, Cal., has been commissioned captain in the military intelligence branch of the Army.

Dr. Thomas Buck, assistant professor of mathematics at the University of California, has been commissioned a first lieutenant in the ordnance department of the army, and will be located in Washington doing research work in ballistics.

Dr. C. A. Brautlecht, professor of chemistry in the Florida College for Women, has been called into the Sanitary Corps as first lieutenant. He is stationed at the Rockefeller Institute for Medical Research in New York City.

Mr. H. Lyle Smith, instructor in mathematics at Princeton University for the past two years, is now in the office of Major F. R. Moulton, of the Ordnance Department at Washington.

UNIVERSITY AND EDUCATIONAL NEWS

The trustees of the New York Polyclinic Hospital have proposed to transfer the property of that institution to Columbia University, to be maintained for the public service and for advanced instruction and research in medicine and surgery. Polyclinic Hospital, which was built in 1912, has a capacity of 300 beds, with ample provision for private patients. It is due to Dr. John A. Wyeth and

a group of friends, who started a movement to establish a hospital for advanced study and investigation.

AT a recent meeting of the British Textile Institute, at Bradford, it was announced that the aim of the promoters was to obtain a financial backing of £50,000. Donations amounting to close on £7,000 were acknowledged. The aims of the institute are to extend the scope of the institute are "to extend the scope of the technology of the textile trades, to establish and maintain lectureships, to encourage invention and discovery, to promote the standardization of tests, and to provide the essential *liaison* between the business and the scientific mind."

THE total number of students of medicine enrolled in the five universities of Switzerland in the summer semester of 1918 was 1,725. They were distributed as follows: Bâle, 220 (174 Swiss, of whom 15 were women, and 46 foreign, of whom 4 were women); Berne, 385 (242 Swiss, of whom 29 were women, and 143 foreign, of whom 16 were women); Geneva, 381 (163 Swiss, of whom 16 were women, and 218 foreign, of whom 58 were women); Lausanne, 225 (159 Swiss, of whom 13 were women, and 66 foreign, of whom 16 were women); Zurich, 504 (350 Swiss, of whom 56 were women, and 154 foreign, of whom 16 were women).

PROFESSOR JAMES THERON ROOD has resigned as professor of electrical engineering of Lafayette College, to take up the professorship of railway electrical engineering in the department of transportation at the University of Illinois.

MR. M. CANNON SNEED, formerly assistant professor of chemistry at the University of Cincinnati, has been appointed associate professor and head of the division of general and inorganic chemistry at the University of Minnesota.

DR. SHIRO TASHIRO has been made an assistant professor in the department of physiological chemistry of the University of Chicago.

DR. F. D. MURNAGHAN, of the Rice Institute, has been appointed associate in applied mathematics at Johns Hopkins University.

I. NEWTON KUGELMASS, formerly with the departments of chemistry at the College of the City of New York and Columbia University, has been appointed professor and head of the department of chemistry in Howard College in Birmingham, Alabama.

ON account of the death of Associate Professor William G. Mallory, Dr. S. R. Williams, head of the department of physics, who was spending his sabbatical year in research under the auspices of the Federal War Department has returned to Oberlin College and has resumed teaching.

DISCUSSION AND CORRESPONDENCE

INSIDIOUS SCIENTIFIC CONTROL

AN interesting letter by G. A. Miller in SCIENCE, August 2, 1918, page 117, calls attention to the necessity for the vigorous development of science at this time, and to the danger that we may win the war in the military sense, only to find ourselves dominated by German knowledge and German science, because of the fact that the Germans have continued their scientific work during the war, whereas in the United States, England, France and Italy, the activities of scientific men have been turned toward war problems, as was necessary from the great lack of preparation for war in these countries, and as was not necessary in Germany, owing precisely to the great preparations which had been made.

Much has been said and still more assumed during the past two decades in regard to the German proficiency over and above that of other peoples in all realms of science; and it has been the feeling of many teachers and of many students that the German language was more essential for scientific uses than any other, and that the German training was the one to which our graduates who were not satisfied with what they found in this country should turn. This American feeling was undoubtedly expressly fostered by the German government, and probably will again be fos-

tered by it. Any government should foster any plan that would lead to the high regard of its country in scientific matters, and especially in regard to the advanced training of the young. The French and English have been too indifferent to the advantages of having American students come to them for their doctorates. The United States can hardly hope to attract many European students in the next few years, but the institutions and the government of the United States should foster the advent to our country of large numbers of Chinese and Japanese students; their number is already considerable, but should be studiously augmented.

This sort of scientific control is subtle, and if turned to bad uses, may become insidious; but is almost certain in the case of a democratic country like ours to escape misuse, and to realize many useful objects.

Why should our scientists look to Germany and to the German language as necessary for scientific advance in this country? It seems to me that the German advances in science are not themselves alone responsible, not perhaps even a small part of the reason, for our past devotion to Germany. The fact is that any scientist must have the means himself readily to look up the literature on any scientific subject; and the fact is that the great compendiums of science, the great yearly reviews of scientific progress, are made by Germans, and published in the German language. It is impossible for a mathematician to work to advantage without being able to consult the *Jahrbuch für Mathematik*. The *Revue Semestrielle* will not alone suffice, nor is it necessary. It is impossible for a physicist to work without consulting the *Fortschritte der Physik; Science Abstracts* are not sufficient. And so it is in many other fields of science. The physicist must consult Winkelmann's "Handbuch der Physik"; there is no real English or French equivalent. The "Mathematical Encyclopedia" commenced its publication as a German compendium indispensable to the mathematician; fortunately, an improved edition was soon taken up in France.

In my opinion, whatever country takes care of the preparation and publication of the best reviews of progress in science, and of the best compendiums of scientific knowledge will inevitably be regarded by other countries as an essential for scientific development, and the language of that country will have to be taught to all young scientists. This, again, is subtle control, which may be used for good or bad, according as it is exercised for good or bad motives. That the government of Germany was alive to the possibility of this control seems patent; and that they expected their insidious control to be serviceable to them in swaying opinion in this country in their favor during this war is equally manifest from many points of view.

Are the English-speaking peoples of the world to return at the close of the war to the well-nigh complete dependence on Germany for their standard scientific reviews and handbooks, and thus make necessary the learning of the difficult German language for all young scientists?

Irrespective of how this question may be answered, the learning of the German language, like that of any foreign language, will always be valuable to scientists. I have myself, for example, been obliged to read during the last ten years German and French constantly, Italian very frequently, Dutch, Spanish, Norwegian and modern Greek occasionally, and I have regretted the fact that I could not read Russian. All linguistic attainments can be put to useful ends by any one interested in science, and all linguistic failures are from time to time an annoyance. I am, therefore, not asking whether it is desirable that young men should be able to read German. Of course it is; but I am asking whether they shall be compelled to read German, whether or not they read any other language.

The preparation of yearly reviews of the advance in science and of great compendiums of past scientific progress is a matter which requires organization, industry and cheap intellectual labor. There seems to be plenty of cheap intellectual labor in this country, and plenty of organizing ability, and probably sufficient industry in the work could be obtained. The

advantage of having such books printed in English would be much greater than that of having them printed in German because the number of English speaking people is much greater than the number of those who speak German as a native language. The regions of the world in the control of the English-speaking peoples are very extensive, and well situated to sustain a large population, so that the disparity between the number of English-speaking people and the number of German-speaking people is bound to increase rapidly. With the stimulus that this war has given to scientific and engineering work, with the emphasis that it has laid on the necessity for a country to be thoroughly developed in science and engineering, the chances are that the English-speaking peoples will give greater relative attention in the future than in the past to science and engineering. It may therefore be inferred as probable that the number of English-speaking people using reviews and handbooks will be considerably greater than the number of German-speaking people. Moreover, English is not a difficult language for a foreigner to learn to read.

In an Executive Order issued by President Wilson on May 11, 1918, the National Academy of Sciences was requested to perpetuate the National Research Council, the duties of which should be as follows:

1. In general, to stimulate research in the mathematical, physical and biological sciences, and in the application of these sciences to engineering, agriculture, medicine and other useful arts, with the object of increasing knowledge, of strengthening the national defense, and of contributing in other ways to the public welfare.

2. To survey the larger possibilities of science, to formulate comprehensive projects of research, and to develop effective means of utilizing the scientific and technical resources of the country for dealing with these projects.

3. To promote cooperation in research, at home and abroad, in order to secure concentration of effort, minimize duplication, and stimulate progress; but in all cooperative undertakings to give encouragement to individual initiative, as fundamentally important to the advancement of science.

. . . . . .

6. To gather and collate scientific and technical information at home and abroad, in cooperation with governmental and other agencies and to render such information available to duly accredited persons.

It seems to me as though the National Research Council could not adequately fulfil the duties assigned to it by the President of the United States as enumerated above without undertaking the organization of the publication of yearly reviews of the progress in science and engineering and of occasional compendiums of knowledge already acquired and digested. How otherwise can the council better stimulate research, better afford a survey of the larger possibilities of science, better promote cooperation in research, or more effectively gather and collect scientific and technical information? Moreover, by so doing the council would displace the insidious control of Germany which has been developed into a propaganda not at all flattering to our scientific value, and actually dangerous to the national defense.

EDWIN BIDWELL WILSON
MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
CAMBRIDGE, MASS.,
October 23, 1918

NEMATODES ON MARKETABLE FISHES

THE attention of the writer was called to the problem of attacks of nematodes on marketable fishes while on a visit to Norway during the year 1917. The visit was extended to the northern part of Norway, where the writer came in direct contact with fishermen and had the opportunity to study the problem at close range. The villagers in northern Norway are dependent upon fish to a large extent as a diet. When the writer was there, he frequently heard it remarked when purchase of fish for a meal was to be made: "Don't get one with 'kveisa.' Get fat ones." "Kveisa" is the common name given by the people to round worms found on the liver and stomach in fishes.

Various food fishes common to the coast of Norway, such as *Gadus virens, G. callarias, G. æglefinus, Lycodes esmarckii, Molva vulgaris, M. byrkelange, Brosmius brosme, Hippoglossus vulgaris, Pleuronectes platessa, P. limanda, Sebastes marimus* and others have round worms on the liver; but only those that commonly live near the coast or in shallow water, such as *G. callarias* and *G. virens* seem to be considerably affected.

When many round worms find their way into the muscles of the body of the fishes its health is impaired. The nematode lodges itself between the metameres of the muscles where it becomes encysted. The effect on the fish is marked. Those with a considerable number of intermetamerically encysted worms become sluggish in movements and in time are not able to chase their food. Consequently these fish become an easy prey to their enemy. Examination of several specimens of *G. virens* and *G. callarias,* from various localities, showed that the muscles of apparently healthy specimens were also infected. Fortunately the larger fish on the coast of Norway have not, as a rule, many enemies among themselves; but if the nematode invasion becomes too great they may succumb from lack of ability to catch their own food. This is particularly true of carnivorous species. On the other hand, smaller specimens, if infected, are easily preyed upon. The cause for this disease must be sought in the diet of the fish.

Seventeen years ago, when the writer was a resident of northern Norway, this disease among food fishes was unknown to the consumer of fish. Kveisa were always known to be on the liver, for they could be readily seen; but they were not considered to be of any consequence. If the liver was prepared for table use, which is commonly done when it is obtained absolutely fresh, its capsule and trabeculæ were removed together with the kveisa. But if the consumer at dinner time finds kveisa in a morsal of fish he naturally loses his appetite at once. This in consequence interferes with the use of such kinds of fish as a diet. In fact, newly caught codfish which formerly were one of the most tempting offers to any family table, had little chance in 1917 at the villages of Rörvik i Namdalen, Brönnöy, Sandnessjöen and Stokmarkness. The people knew that the fish were diseased and did not care to buy them.

The fishing industry has been one of the largest industries in Norway for many years. The intestines have not been utilized except by farmers, in northern Norway, who use them as fertilizer. Those people, however, who depend entirely on fishing for their living throw the intestines overboard when the fish is sloughed. It is probable that healthy fish by feeding on infected viscera acquire so many of the parasites that they succumb to their injurious effects.

Along the coast of Norway, the younger generations of shore cods (*Gadus callarias*) and bluefish (*Gadus virens*) commonly seek shallow water for feeding purposes. At fishing villages where a great deal of cleaning of catches takes place the young fish find ample food from discarded intestines, and as all the viscera are as much inffected as is the liver, it may be fair to assume that this material is the cause of the nematode infection.

It is conjectured that when food gets scarce and the vitality of the fish decreases the effect of the nematode inroad is increased. This was indicated by the fact that all of the poorer specimens, of the species *G. callarias* and *G. virens,* which were examined, were much more infected with nematodes than were the healthier ones.

It may be fair to assume that the attack of nematodes on marketable fishes in Norway may become an economic problem of considerable importance. If, however, it is proved that the worms found in the flesh are of the same species as those commonly found on the viscera, the present extensive infection may be remedied by stopping the feeding of young fish on infected viscera. The danger of this infection does not lie in transferring the nematode parasite to man, for that is improbable, but it is unpleasant to eat worms. The problem is, to what extent will the disease diminish the use of nematode infected fish as a diet; and decrease the number of the

species involved, and how may the disease be eradicated?

H. P. K. AGERSBORG
HOAGLAND LABORATORY,
LONG ISLAND COLLEGE HOSPITAL,
BROOKLYN, N. Y.

PAPERS "TO BE PUBLISHED"

IT seems to the writer that one of the most annoying things in looking up the literature on a subject is to come across the statement that the particular point one is interested in has been worked out by some previous writer but publication was postponed for some reason. For example, in 1903 this statement appeared: "The embryology of the corn grain was studied and figures were made of the ovule at different stages beginning with the archesporial cell and ending with the fully developed embryo. These drawings and observations not being complete will be reserved for another paper." Two or three workers have recorded the fact that their search for a more recent paper has been in vain, and have remarked on the needlessness of sending them on a wild goose chase.

Another example, published in 1912, is even more serious than the one quoted above. It also concerns maize, and is as follows: "The writer has evidence (not yet published) upon various strains of pod varieties and their hybrids with other podless varieties to show that the pod character, in that form, never was a normal or original pod or glume in *Zea*; and it is also evident that the new branched ear, as it is, is not a reversion to a former one." Here the writer records important conclusions without giving any evidence on which to found them. Of course they carry little weight as they stand, but simply cloud the question at issue. They seem to have been put forth simply to gain priority without the effort being made to substantiate or record the facts back of the conclusions. This seems to be the case, especially when years elapse before the "evidence" is published, as in the case in point.

Undoubtedly many other similar instances could be cited, but these two are sufficient to illustrate what is meant. It is probable that at the time the above were written the authors really expected to follow shortly with second papers, but through some unforeseen circumstances they had to postpone their publication indefinitely. From the viewpoint of the person following up, would it not be better to omit statements as to future efforts and future conclusions and save them for the papers "to be published"? It is probably true that some results worthy of note have come from following up "leads" of this nature, but scientific courtesy forbids the pursuit of such a hint until a more than reasonable time has elapsed after publication, and even then the average person does not care to work on problems where priority claims have been made upon conclusions one may reach.

HORACE GUNTHORP
WASHBURN COLLEGE,
TOPEKA, KANS.

QUOTATIONS

MASKS IN GAS WARFARE

THE masks now used are nearly all of the canister type: that is, the inhaled air is drawn in through a canister containing certain materials which will react with, or absorb, the gases before they enter the mask itself. This mask consists of a close-fitting fabric, containing usually more or less rubber in its structure, and held in place by elastic straps over the head. The exhaled breath escapes from the mask through a rubber valve which opens only from pressure from the inside. The time allowed to put on the mask, when slung by a strap from the neck, is under ten seconds. It is carried in a canvas case, and when the forces are within two miles of the front, they are required to wear the outfit in the "alert" position, ready for instant use, night and day.

An important feature which has been the occasion of much scientific study is the eye piece of the masks, to avoid dimming from the moisture accumulating within. Anti-dimming preparations have been found, and lately, as the result of many experiments, materials devised which reduce this difficulty to a minimum, under ordinary conditions of use.

Great improvements have been made in the effectiveness of the absorbent materials used in the canisters, and this, in turn, has increased several fold the general efficiency which it was possible to attain at the time when the manufacture of the masks was first undertaken, and hence to diminish the amount of material to be placed in the canisters. The significance of this will be understood when it is realized that there is a considerable friction to overcome when the inhaled air is drawn through the canister. This was so great in the earlier masks, that it made necessary a suction on the part of the wearer of the mask equal to that required to raise a column of water in a tube to a height of six inches; an effort not incomparable with that made by many asthmatic sufferers to draw air into the lungs. This frictional resistance has been materially lessened by the improvement in the protective materials, and every reduction, however slight, is a great boon to the troops. The materials used in the canisters are selected to react with gases of an acid character, and with those capable of destruction by oxidation, a process like that generally known as combustion. Much reliance is, however, placed upon the absorptive power toward gases exhibited by many porous substances, notably, high grades of charcoal. The principle is the same as that utilized in the "charcoal filters" sometimes attached to our faucets to clarify water supplies.

Of late a new problem has been presented, because of the use of gases in the form of "smoke-clouds," which easily pass through the protective materials contained in the canisters. This has necessitated the addition of another filtering medium, and has necessarily added somewhat to the resistance to be overcome.

How serious this "neutralization" of troops through the continuous wearing of masks may be, is illustrated by the condition which obtained before one of the recent violent attacks on the Western Front. It has been stated that the enemy fired gas-shells (mainly mustard-gas) at the rate of two hundred thousand shells per day for four days, each shell probably averaging about five pounds of material. While the gas-masks will protect the wearer from the inhalation of this gas, they must have required one or more renewals during this period. This attack was followed by a smoke-cloud attack which necessitated the use of the extension filters, thus subjecting the troops to added labor in breathing, after days of constant use of the mask. The physical strain under such conditions can not fail to have been severe. It is not, however, to be supposed that the enemy was allowed to spend his time in full comfort.

As a means of detecting the approach of a toxic gas, canaries and white mice are placed in the trenches, as they are peculiarly sensitive to these chemicals and show signs of distress from dilutions which are unnoticed by man, especially when the gases are nearly odorless.

Of the offensive side of this gas-war it is obvious that little can properly be made public. There is reason to believe that our American chemists are making valuable contributions in this field.—Henry P. Talbot in the *Atlantic Monthly*.

SCIENTIFIC BOOKS

Agricultural Bacteriology. By W. H. Conn. Third edition, revised by Harold Joel Conn. Philadelphia, P. Blakiston's Son & Company. 1918. Pp. x + 357. Illustrated. with 63 figures. $2.00.

The first part of the book is taken up with a discussion of the general characters of microorganisms and their rôle in the decomposition of organic matter. The second part, which occupies practically one fourth of the volume, is devoted to the relations of bacteria to soil fertility. The cycles of carbon and nitrogen are presented. This section includes a chapter on 'The Manure Heap and Sewage" and on one "Bacteria in Water." In the latter the rôle of water in the distribution of disease-producing organisms is discussed. The third part presents the relation of bacteria to milk and to butter and cheese.

The use of microorganisms in industrial processes directly related to agriculture as in the manufacture of alcohol and of vinegar, the preparation of sauer kraut and silage, and in the retting of flax is discussed in the fourth part.

The fifth part includes a chapter on resistance against parasitic bacteria. Tuberculosis is discussed in some detail. Only fourteen pages are devoted to the other transmissible diseases of animals and fifteen pages to the parasitic diseases of plants.

The last part presents 39 laboratory exercises designed to supplement the text.

The second edition was marred by many mistakes, both in fact and statement. Many of these have not been corrected in the present edition. Errors in fact are illustrated by the statement that ordinary soils contain 0.1 to 0.2 per cent. of nitrate (p. 53); that H_2S may unite with water to form sulphuric acid (p. 78); that the sulphur appears within the cells of sulphur bacteria as minute reddish dots, and because of the color produced by the sulphur the bacteria are frequently called the "red bacteria" (p. 124). In fact the reddish color noted in some of the sulphur bacteria is not due to sulphur but to a pigment, purpurin. If the red color were due to sulphur, all bacteria that store sulphur would be red. Such is not the case.

It is stated that any product that contains much sugar is more likely to undergo alcoholic fermentation than putrefaction. A true statement as far as it goes, but likely to create confusion in the mind of the student, for a product containing much sugar practically never undergoes putrefaction and an alcoholic fermentation only when the product is so acid as to prevent bacterial development. In sugar containing liquids, the reaction of which will permit bacterial growth, an acid fermentation is constantly noted as in milk, maple sap, beet juice, etc.

The construction is often loose and in error, one part of a sentence being written in the present tense and another in the past, *e. g.*, "But the bacteria which are isolated from such soil by ordinary methods showed no power of nitrification" (p. 65). Errors in spelling are frequent, *e. g.*, volitization (p. 80), seradella (p. 112), urase (p. 60).

An example of the use of an incorrect word is found on page 63 where it is stated that "The addition of another atom of nitrogen to the nitrate, giving a nitrate," etc. The formulæ used in this connection are correct.

The reader of the present volume will find the essential facts concerning the relation of microorganisms to agricultural processes presented in a most interesting manner.

E. G. HASTINGS
UNIVERSITY OF WISCONSIN

BIRTH STATISTICS IN THE REGISTRATION AREA OF THE UNITED STATES: 1916

IN the recently established birth-registration area of the United States—comprising the six New England states, New York, Pennsylvania, Maryland, Michigan, Minnesota and the District of Columbia, with an estimated population of 33,000,000, or about 32 per cent. of the total population of the United States—818,983 infants were born alive in 1916, representing a birth rate of 24.8 per 1,000 of population. The total number of deaths in the same area was 486,682, or 14.7 per 1,000. The births thus exceeded the deaths by more than 68 per cent. For every state in the registration area, for practically all the cities, and for nearly all the countries, the births exceeded the deaths, usually by substantial proportions. The mortality rate for infants under one year of age averaged 101 per 1,000 living births. The foregoing are among the significant features of the report. "Birth Statistics in the Registration Area of the United States: 1916," soon to be issued by Director Sam. L. Rogers, of the Bureau of the Census Department of Commerce, and compiled under the supervision of Dr. William H. Davis, chief statistician for vital statistics.

The birth rate for the entire registration area fell below that for 1915 by one tenth of 1 per 1,000 population; while the death rate exceeded that for 1915 by seven tenths of 1 per

1,000. The excess of the birth rate over the death rate for 1916, 10.1 per 1,000, was thus a little less than the corresponding excess for 1915, which was 10.9 per 1,000. If the birth and death rates prevailing in the later year were to remain unchanged, and if no migration were to take place to or from the area to which they relate, its population would increase annually by about 1 per cent. This rate, compounded for a decade, would yield a decennial increase of a little more than 10 per cent., or about half the rate of increase in the population of the country as a whole between the last two censuses, 21 per cent.

Of the total number of births reported, 799,817, or 24.9 per 1,000, were of white infants, and 19,166, or 22.8 per 1,000, were of colored infants. The death rates for the two elements of the population were 14.5 and 24.4 per 1,000, respectively. The deaths reported for the colored races (comprising all nonwhites) thus exceeded the births reported; but it is probable that the registration of births is less nearly complete among the colored than among the white population, and that therefore the rate shown for the former class is too low, whereas in the case of death rates there is probably not so great a margin of error.

Some indication of the fecundity of the native and foreign elements of the population may be obtained from a comparison between the proportion which the number of white foreign-born mothers formed of the total number of white mothers to whom children were born in 1916, and the proportion which the white foreign-born married women, aged 15 to 44, formed of the total number of white married women of corresponding ages in 1910.

From the table following, it appears that many more births occur to white foreign-born women, proportionately to their number, than to native women. In Connecticut, approximately 46 per cent. of white married women aged 15 to 44 in 1910 were of foreign birth, but about 62 per cent. of the white mothers to whom children were born in 1916 were natives of foreign countries.

The infant-mortality rate—that is, the number of deaths of infants under one year of age per 1,000 born alive—throughout the registration area as a whole was 101 in 1916, as against 100 in 1915. This is equivalent to saying that of every ten infants born alive one died before reaching the age of one year. Among the 11 states these rates ranged from 70 for Minnesota to 121 for Maryland; and for the white population separately the lowest and highest rates were 69 for Minnesota and 115 for New Hampshire. The high rate for the total population of Maryland was due to the presence of a larger colored element in that state than in any of the others, the rate for the whites alone being only 101.

State	1916: Per Cent. which Foreign-born Mothers Formed of Total White Mothers	1910: Per Cent. which Foreign-born Married Females 15 to 44, Formed of Total White Married Females, 15 to 44
Connecticut	61.63	46.36
Maine	27.23	21.89
Maryland	14.82	13.11
Massachusetts	56.32	48.87
Michigan	32.80	26.45
Minnesota	26.80	33.99
New Hampshire	41.69	32.69
New York	52.84	42.71
Pennsylvania	37.65	27.77
Rhode Island	57.37	49.94
Vermont	24.04	18.11

The infant-mortality rates vary greatly for the two sexes and for the various nationalities.

With an infant-mortality rate of 101 for the registration area as a whole, the rate ranges for white children from 68 where mothers were born in Denmark, Norway and Sweden, to 148 where mothers were born in Poland, while negro children have a rate of 184. The range of rates among white males is from 74 for children of mothers born in Denmark, Norway and Sweden, to 171 for those of mothers born in Poland, while negro males have a rate of 202. The corresponding rates for females were 62, 124 and 166, respectively.

The following table shows, for the birth-registration area, by states and by cities having more than 100,000 inhabitants in 1910, the number of births in 1916, the per cent. of ex-

cess of births over deaths, and the infant-mortality rate. Figures for the white and colored elements of the population are shown separately for those areas in which colored persons constitute more than one tenth of the total population.

EXCESS OF BIRTHS OVER DEATHS, AND INFANT MORTALITY: 1916

Area	Number of Births	Excess of Births Over Deaths (Per Cent.)	Deaths of Infants Under 1 Year of Age per 1,000 Living Births
Registration area	818,983	68.7	101
Registration states			
Connecticut	35,351	74.2	101
Maine	16,033	32.5	108
Maryland, total:	33,631	49.7	121
White	27,305	63.9	101
Colored	6,326	6.0	209
Massachusetts	93,497	65.1	100
Michigan	86,840	88.1	96
Minnesota	55,459	127.1	70
New Hampshire	9,664	35.4	115
New York	241,456	58.8	94
Pennsylvania	217,449	74.7	114
Rhode Island	14,634	53.5	111
Vermont	7,768	37.2	93
Registration cities having more than 100,000 inhabitants in 1910			
Connecticut:			
Bridgeport	4,598	94.8	106
New Haven	5,106	100.6	88
Maryland:			
Baltimore, total	14,542	36.5	122
White	12,278	54.1	104
Colored	2,264	−16.6[1]	219
Massachusetts:			
Boston	19,577	53.3	105
Cambridge	2,691	76.3	91
Fall River	3,689	68.8	173
Lowell	3,287	67.6	146
Worcester	4,941	70.2	101
Michigan:			
Detroit	24,289	121.6	112
Grand Rapids	3,131	100.0	75
Minnesota:			
Minneapolis	8,793	95.2	82
St. Paul	5,242	87.6	68
New York:			
Albany	2,280	11.4	97
Buffalo	13,088	73.3	114
New York	137,923	77.0	93
Rochester	6,816	82.6	86
Syracuse	3,853	63.2	100
Pennsylvania:			
Philadelphia	40,360	45.7	105
Pittsburgh	16,406	62.6	115
Scranton	3,623	71.5	131
Rhode Island:			
Providence	5,981	48.7	110
District of Columbia:			
Washington, total	7,201	11.2	106
White	4,979	25.3	83
Colored	2,222	−12.2[1]	158

[1] Per cent. by which births fell below deaths.

SPECIAL ARTICLES

NOTE UPON THE HYDROGEN ION CONCENTRATION NECESSARY TO INHIBIT THE GROWTH OF FOUR WOOD-DESTROYING FUNGI[1]

THE importance of hydrogen (and hydroxyl) ion concentration as a factor in physico-chemical and biochemical studies of living organisms is being recognized. A careful study of this factor has not been made heretofore due largely to the lack of ready means for making the determinations. The indicator method was not seriously developed until about a decade or so ago, and the hydrogen electrode was not applied to such problems until recently, due partly, undoubtedly, to the fact that biologists did not realize its possibilities.

Consequently no exact information is at hand concerning the behavior of fungi, in general, toward varying degrees of hydrogen ion concentration. This remark applies especially to wood-destroying fungi. Information which is available is usually given in a rather vague manner with the use of such terms as "alkaline," "slightly acid," "strongly acid" or as percentage of acid (or base) added.

The expression, P , is now widely used as a means of stating hydrogen (or hydroxyl) ion concentration. The term is used and explained in the literature sufficiently often to make its explanation here unnecessary.

The four fungi studied in this investigation are: *Lenzite sepiaria, Fomes roseus, Coniophora cerebella* and *Merulius lachrymans*. Synthetic and malt extract media were used. The data obtained showed that their growth is not inhibited until a surprisingly

[1] This note is a brief statement of the results presented in a paper on the same subject in partial fulfillment of the requirements for the degree of Ph.D. at the New York State College of Forestry at Syracuse University. A considerable part of the work was done in the office of Forest Pathology, Bureau of Plant Industry, at the Forest Products Laboratory, Madison, Wis. Detailed data will be published soon.

high hydrogen ion concentration is reached, and furthermore, that these four organisms respond in about the same way, though there are distinct variations among them. Furthermore, as might be expected, the curves obtained are similar to those showing the relation between enzyme activity and hydrogen ion concentration.

The most important facts to be presented here can be shown by means of a general curve setting forth the general behavior of the four fungi studied. The curve shown in the accompanying figure is constructed by plotting as ordinates the weights in grams of mycelium, produced in about five weeks' time upon media of varying P_H values as represented by the abscissae. This curve shows in a very general way the mean of the individual curves for the different fungi when grown upon the two media. The weight of mycelium produced shows large variation among the individual curves while there is rather close agreement in the P_H values which are physiologically important to the various fungi.

In the following discussion we shall speak of the "first critical point," meaning the P_H at *B* (figure), the point where the first marked deflection in the growth curve appears; the "second critical point," meaning the P_H at *C*, where the second marked deflection in the opposite sense occurs in the growth curve; and the limiting acidity," meaning the P_H at *D*, where practically no growth occurs. By "critical range" we shall mean the range of the P_H values included between the first and the second critical points.

The curve in the accompanying figure is drawn with the portion *AB* horizontal. In the individual curves—that is for a single fungus on a single medium—this part may be horizontal or may slope either up or down in passing toward *B*. Or again, in passing from *A* toward *B* the curve may rise to a maximum and then fall toward the critical point *B* where a sharp inflection downward occurs. Such a maximum, when present, usually occurs nearer *B* than *A*—that is, at a P_H of about 3.0. The critical points stand out more sharply in some than in other curves and the first critical point is usually more pronounced than the second critical point. The slope between *B* and *C* shows a rather large variation in the

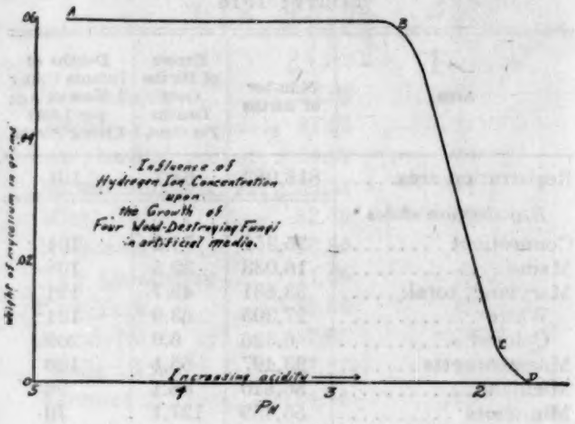

Fig. 1.

individual curves. In some cases the line between these two points is nearly vertical. In this curve the point *D* appears as a rather abrupt point. Point *C* often occurs nearer the lower axis and the portion of the curve *CD* occurs more nearly horizontal with a more or less uncertain termination. However, the limiting P_H value appears to be in the region of 1.7.

Translating these data into terms of normality, the first critical point occurs at about 1/350 normal, and the limiting acidity at about 1/50 normal, hydrogen ion concentration.

Merle R. Meacham

The New York State College of Forestry,
Syracuse University